

NAVAL HOSPITAL, SAN DIEGO



JOINT BIOMEDICAL ENGINEERING PROJECT

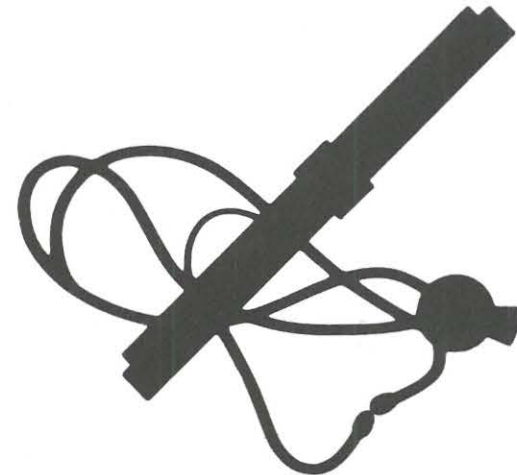


NAVAL ELECTRONICS LABORATORY CENTER

PREFACE

THIS BROCHURE CONSISTS OF GRAPHIC MATERIAL USED IN THE JOINT NHSD/NELC SLIDE PRESENTATION ON THE BIOMEDICAL ENGINEERING PROGRAM. AS SUCH IT IS NOT A SELF-SUFFICIENT DOCUMENT, BUT YOU MAY FIND IT OF CONVENIENCE FOR NOTE-TAKING AND LATER USE AS A MEMORY AID.

THE MATERIAL IS ORDERED ROUGHLY IN THE SAME SEQUENCE AS IN THE SLIDE PRESENTATION.



NHSD STATISTICS

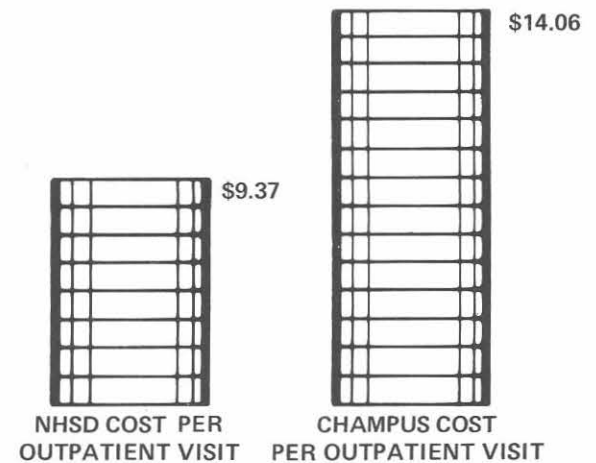
• ELIGIBLES (WITHIN 30-MILE RADIUS)	655 939
• BED CAPACITY — NORMAL	1875
• BED CAPACITY — MAXIMUM	2583
• AVERAGE DAILY PATIENT CENSUS	1559
• MEDICAL PERSONNEL	356
• LABORATORY TESTS/MONTH	197 908
• PRESCRIPTIONS FILLED/MONTH	89 936
• X-RAYS/MONTH	41 979
• SINGLE VISION LENSES MANUFACTURED/MONTH	6000
• ELECTROCARDIOGRAMS/MONTH	3000
• EYE EXAMINATIONS/MONTH	2500

PERCENTAGE OF ELIGIBLES RECEIVING CARE



COSTS

78.4% OF ELIGIBLES ARE NOT SERVICED BY NHSD AND MUST RECEIVE CIVILIAN CARE (CHAMPUS)



FINANCIAL CONSEQUENCE OF INADEQUATE FACILITIES

- INSUFFICIENT FACILITIES AT NHSD RESULT IN **2,625,895** OUTPATIENT VISITS THAT CANNOT BE SERVICED
 - AS A CONSEQUENCE, A CHAMPUS EXPENDITURE OF **\$36,920,083** MUST BE MADE TO PROVIDE SERVICE TO ALL ELIGIBLES AT NHSD
 - IF THIS SAME SERVICE COULD BE PROVIDED AT NHSD, THE COST WOULD BE **\$24,604,636**
- OR, A NET TOTAL SAVINGS OF **\$12,315,447**

NOTE: ALL FIGURES BASED ON 1 YEAR.

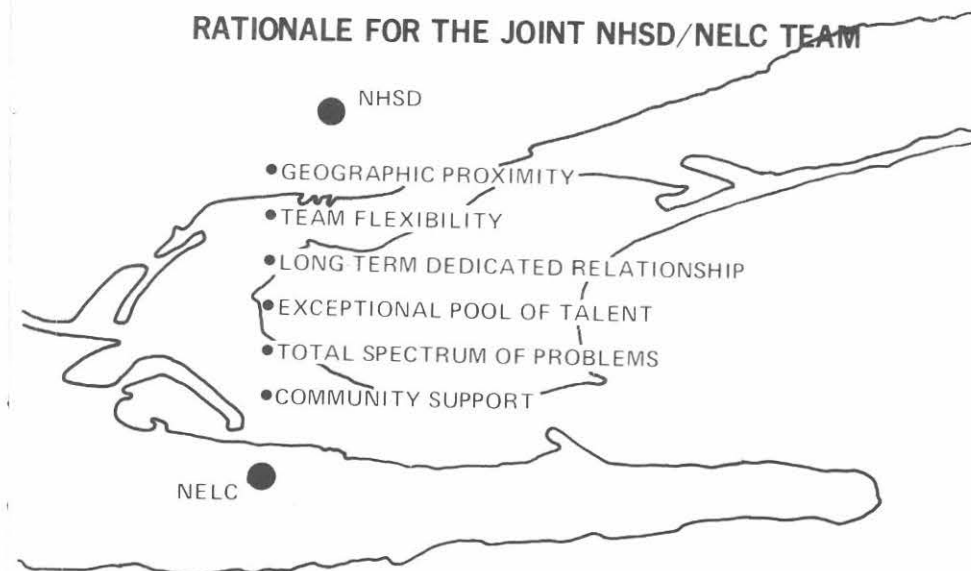
PATIENT CARE PROBLEM AREAS AT NHSD

<u>PROBLEM AREAS</u>	<u>BIOMEDICAL ENGINEERING SOLUTIONS</u>
• EXCESSIVE MANUAL INVOLVEMENT CONDUCTING TESTS AND HANDLING RECORDS	• AUTOMATED MEASUREMENT AND CONTROL SYSTEMS, INSTRUMENTATION AND DATA PROCESSING
• OUTMODDED RECORDS SYSTEM	• OPERATIONS RESEARCH AND DATA PROCESSING
• SAFETY HAZARDS	• ELECTRICAL SAFETY PROGRAM
• INOPERATIVE ELECTRONIC INSTRUMENTATION	• MAINTENANCE AND REPAIR PROGRAM
• INADEQUATE TOOLS FOR MONITORING AND DIAGNOSIS	• INSTRUMENTATION AND RESEARCH, MICROELECTRONICS IMPLEMENTATION
• POOR PATIENT-PHYSICIAN RATIO	• ELIMINATION OF NON-ESSENTIAL TASKS FOR PHYSICIANS AND TRAINING OF PARAMEDICAL PERSONNEL

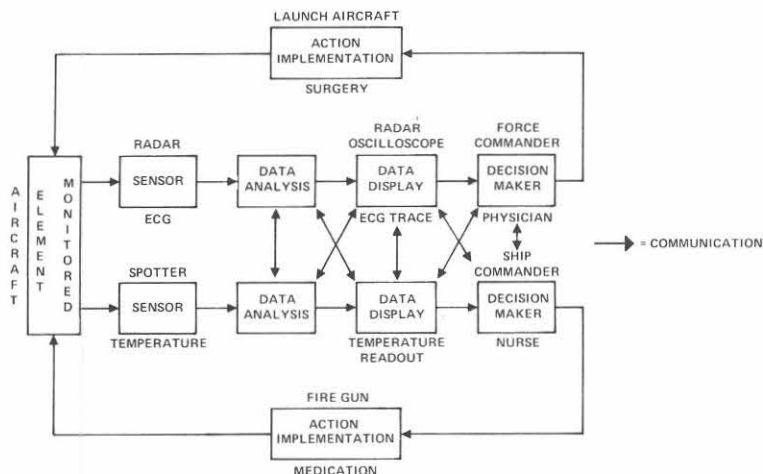
PERSPECTIVE

- DEDICATED PERSONNEL ARE ATTEMPTING TO MEET UNPRECEDENTED DEMANDS WITH OUTMODDED FACILITIES AND PRACTICES. PRESENT PROBLEMS WILL BE COMPOUNDED WHEN REGIONALIZATION POLICIES ARE PUT INTO EFFECT

RATIONALE FOR THE JOINT NHSD/NELC TEAM



SIMILARITY OF NELC MISSION TO ROLE OF HEALTH CARE DELIVERY



APPLICATION OF NELC CAPABILITIES TO MEDICAL PROBLEMS

- OPERATIONS RESEARCH
EFFICIENT SYSTEMS
- PROJECT MANAGEMENT
EXPERIENCE IN COORDINATING AND OPTIMIZING DIVERSE
EXPERTISE OF NELC AND NHSD
- HUMAN ENGINEERING
EQUIPMENT AND FACILITY DESIGN
INFORMATION DISPLAY
- SYSTEM INTEGRATION
COMBINATION OF MULTICOMPONENT SYSTEMS INTO
FUNCTIONAL UNISYSTEM
- COMPUTER SCIENCE
EFFICIENT RECORD HANDLING, INFORMATION RETRIEVAL,
DISPLAY AND REDUCTION
- CIRCUIT DESIGN
PATIENT MONITORING SYSTEMS
- MICROELECTRONICS
INSTRUMENTATION, HYBRID ELECTRONICS FOR SPECIAL
PURPOSE COMPUTERS, TRANSDUCERS
- COMMUNICATIONS
INTERSYSTEM COMMUNICATIONS, TELEMETERING, MODEMS
- DISPLAY TECHNOLOGY
ANALOG AND DIGITAL DISPLAY OF PHYSIOLOGICAL INFORMATION
TV DISPLAYS
- DECISION AND CONTROL
ANALYSIS AND DIAGNOSIS OF PHYSIOLOGICAL DATA
IMPLEMENTATION OF APPROPRIATE CONTROL ACTION
- PACKAGING AND MECHANICAL ENGINEERING
RUGGEDIZED DESIGN FOR HOSPITAL ENVIRONMENT
AND MAINTENANCE
- SYSTEMS PROGRAMMING
OPERATING AND EXECUTIVE COMPUTER PROGRAMMING SYSTEMS

BIOMEDICAL ENGINEERING SUPPORT FOR NAVAL HOSPITALS

PROGRAM OVERVIEW

- PHASE I: A. BASELINE DESCRIPTION
 B. STATE-OF-THE-ART REVIEW
 C. INTERIM AND DEMONSTRATION PROJECTS
- PHASE II: THE IDEAL CONFIGURATION
- PHASE III: THE TARGET CONFIGURATION
- PHASE IV: SYSTEM BREAKOUT
- PHASE V: IMPLEMENTATION

PHASE IA: BASELINE DESCRIPTION

- CURRENT NHSD MEDICAL-CARE SYSTEM DESCRIPTIONS
- IDENTIFICATION OF SPECIFIC PROBLEM AREAS
- NARRATIVE DESCRIPTIONS, FLOW AND PROCESS CHARTS, PHOTOGRAPHS, LINE DRAWINGS, AND STATISTICAL SUMMARIES FOR REFERENCE
- POINT OF DEPARTURE FOR FUTURE R&D EFFORT IN BIOMEDICAL SYSTEMS

PHASE IB: STATE-OF-THE-ART REVIEW

- SYSTEMATIC REVIEW OF INSTRUMENTATION, EQUIPMENTS, SYSTEMS, AND SOFTWARE APPLICABLE TO HOSPITAL MEDICAL CARE
- NEEDED TO PREVENT "REINVENTING THE WHEEL" AND TO IDENTIFY IMPROVEMENT POSSIBILITIES
- USED BY THE VARIOUS TEAM DISCIPLINES, INCLUDING MEDICAL SPECIALTIES, OPERATIONS RESEARCH, SYSTEMS ENGINEERING, COMPUTER SCIENCE, HUMAN FACTORS, AND ELECTRONIC AND MECHANICAL ENGINEERING

SHORT-TERM BIOMEDICAL ENGINEERING PROJECTS

- AUTOMATED BLOOD PRESSURE MEASUREMENT SYSTEM
- AUTOMATED URINE COLLECTION MEASUREMENT SYSTEM
- AUTOMATIC INTERPRETATION OF ELECTROCARDIOGRAMS
- BLOOD BANK PROGRAM
- ELECTRICAL SAFETY AND EQUIPMENT UTILIZATION
- INTERNAL COMMUNICATION SYSTEMS IMPROVEMENT
- MINICOMPUTER CALCULATOR
- PATIENT MONITORING UNIT
- VISUAL ELECTROPHYSIOLOGICAL RECORDING SYSTEM

MAIN POINTS IN SUMMARY

- THE NAVY IS USING OUTMODED MEDICAL CARE SYSTEMS
- MEDICAL CARE REQUIREMENTS CAN BE MET ONLY BY MAJOR TECHNOLOGICAL IMPROVEMENTS
- THE CHRONIC SHORTAGE OF MEDICAL PERSONNEL CAN BE PARTLY RELIEVED BY AUTOMATION TECHNIQUES
- THE NAVY NEEDS A VIGOROUS RDT&E PROGRAM IN BIOMEDICAL ENGINEERING
- THIS PROGRAM WILL SERVE AS A MODEL FOR OTHER PROGRAMS OUTSIDE THE NAVY
- NHSD AND NELC ARE IDEALLY PAIRED TO TAKE ON A BIOMEDICAL ENGINEERING PROGRAM
- NHSD AND NELC HAVE JOINTLY DEVELOPED A COMPREHENSIVE PLAN FOR SUCH A PROGRAM
- FY 72 FUNDS SHOULD BE MADE AVAILABLE TO INITIATE THIS PROGRAM AS SOON AS POSSIBLE
- COOPERATION AND SUPPORT SHOULD BE ACTIVELY ENCOURAGED FOR THIS PROGRAM

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